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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/826,016	IMASEKI ET AL.
	Examiner	Art Unit
	Ben Lewis	1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Detailed Action

1. The Applicant's amendment filed on May 9th, 2007 was received. Claims 1-2, 4-7 and 15-19 were amended.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action (issued on February 9th, 2007).

Claim Rejections - 35 USC § 112

3. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claims are drawn to a product and have methods of operating or using the product. In this case operating the fuel cell apparatus step(s) mixed in with the apparatus claim. It is held that a single claim, which claims both an apparatus and the method steps of using the apparatus, is indefinite (MPEP 2173.05).

Furthermore, mixing statutory classes together would result in the public not knowing the meets and bounds of the claim and whether or not the claims are being infringed upon.

4. Claims 17-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which

applicant regards as the invention. The claims are drawn to a product and have methods of operating or using the product.

With respect to claim 17, steps of wherein said means increase a ventilation amount within said cooling liquid storage when the fuel gas concentration within said cooling liquid storage container arrives at a prescribed concentration or more.

With respect to claim 18, steps of wherein said gas exhaust mechanism exhausts the gas within said cooling liquid storage container when the pressure within said air pipe is increased. Whereby said fuel gas concentration within said cooling liquid storage container is decreased to a prescribed concentration.

With respect to claim 19, steps of wherein said means decrease the pressure within said cooling liquid storage container to increase the flow amount of said ventilation current when the fuel gas concentration within said cooling liquid storage container arrives at a prescribed concentration or more.

It is held that a single claim, which claims both an apparatus and the method steps of using the apparatus, is indefinite (MPEP 2173.05).

Furthermore, mixing statutory classes together would result in the public not knowing the meets and bounds of the claim and whether or not the claims are being infringed upon.

Claim Rejections - 35 USC § 103

5. Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirakata (U.S. Pub. No. 2001/0019789 A1) in view of Mizuno (U.S. Pub. No. 2002/0189873 A1).

With respect to claim 1, Hirakata et al. disclose a heat exchange system (title) wherein a radiator **10** is a heat exchange device for cooling the cooling water warmed by the fuel cell **30**, and includes an upper tank **12** and a lower tank **14** for temporarily storing the cooling water, and a core **16** for passing the cooling water (Paragraph 0032).

With respect to separating the fuel gas from the cooling liquid, Hirakata et al. teach that in the heat exchange system of the present embodiment, if hydrogen gas leaks into the cooling water, the hydrogen sensors **50** and **52** "means for detecting fuel gas" immediately detect the leakage, and the hydrogen gas leakage warning lamp **92** informs the driver of the leakage. The hydrogen gas collected in the upper tank **12** "hydrogen separator" of the radiator **10** and the hydrogen gas collected at the top of the reserve tank **20** "hydrogen separator" can be easily discharged "exhausted" into the air by opening the radiator cap **18** and the cooling water supply cap **24**, respectively (Paragraph 0060). (It is noted that hydrogen gas is separated from the cooling liquid in tanks **12** and **20** due to their difference in density).

With respect to the mixing of the separated gas with the air supplied or exhausted from the fuel cell, Hirakata teach that when the pressure inside the upper tank **12** is high, the cooling water is pushed out as described above from the upper tank **12** into the reserve tank **20** through the cooling water tube **65** so that the hydrogen gas (separated gas) caught within the upper tank **12** is also pushed out into the reserve tank

20 along with the cooling water. The hydrogen gas pushed out together with the cooling water turns into bubbles in the cooling water **22** and floats up to the surface of the water, to be present at the top of the reserve tank **20** (Paragraph 0058). Hirakata also teach that the reserve tank **20** is a simple sealed type reserve tank, and an air intake tube **66** connects to the reserve tank **20** to maintain atmospheric pressure inside the reserve tank **20** (Paragraph 0043). (It is noted that air form air intake tube mixes with hydrogen at the top of tank **20**).

With respect to exhausting the gas, Hirakata et al. teach that in the heat exchange system of the present embodiment, if hydrogen gas leaks into the cooling water, the hydrogen sensors **50** and **52** immediately detect the leakage, and the hydrogen gas leakage warning lamp **92** informs the driver of the leakage. The hydrogen gas collected in the upper tank **12** "hydrogen separator" of the radiator **10** and the hydrogen gas collected at the top of the reserve tank **20** "hydrogen separator" can be easily discharged "exhausted" into the air by opening the radiator cap **18** and the cooling water supply cap **24**, respectively (Paragraph 0060).

Hirakata et al. does not specifically teach using air supplied to or exhausted from the fuel cell. However, Mizuno disclose an on-vehicle structure of fuel cell system wherein the hydrogen gas discharged from the shut valve **412** is supplied to the hydrogen dilutor **424** after flowing through the discharging channel **405**. Oxygen off-gas is also supplied to the hydrogen dilutor **424** after flowing through the oxygen off-gas introducing channel **505** which branches from the oxygen off-gas discharging channel **503**. The hydrogen dilutor **424** dilutes the discharged hydrogen gas from the shut valve

412 by mixing the supplied hydrogen gas and the oxygen off-gas. The diluted hydrogen gas is introduced into the oxygen off-gas discharging channel **503** and is further mixed with the oxygen off-gas flowing in the oxygen off-gas discharging channel **503**. Then the mixed gas is exhausted into the external atmosphere from the off-gas discharging outlet **514**. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the dilution of hydrogen gas with exhaust air system of Mizuno to dilute the hydrogen of Hirakata et al. because an air diluted exhaust gas with low hydrogen concentration is more safe.

6. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hirakata (U.S. Pub. No. 2001/0019789 A1) in view of Mizuno (U.S. Pub. No. 2002/0189873 A1) and further in view of Jia et al. (U.S. Pub. No. 2003/0224226 A1).

With respect to claim 2, Hirakata et al as modified by Mizuno disclose a heat exchange system (title) in paragraph 7 above. Hirakata et al. as modified by Mizuno do not specifically teach wherein the gas mixed with air supplied to the fuel cell is introduced into the cathode of the fuel cell. However, Jia et al. disclose a conditioning methode for fuel cells (title) wherein, controller **18** signals oxidant shutoff valve **15** to close and signals fuel shutoff valve **16** and fuel conditioning valve **17** to open thereby providing hydrogen directly to cathode **4** (Paragraph 0021). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the hydrogen feed to the cathode of Jia et al. into the fuel cell system of

Hirakata et al. as modified by Mizuno because combustion of hydrogen internally as opposed to environmental exhaustion improves safety of the fuel cell system.

7. Claim 3-6, 8-12 and 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirakata (U.S. Pub. No. 2001/0019789 A1) in view of Mizuno (U.S. Pub. No. 2002/0189873 A1).

With respect to claims 3, 9 and 15, Hirakata et al. disclose a heat exchange system (title) wherein a radiator **10** is a heat exchange device for cooling the cooling water warmed by the fuel cell **30**, and includes an upper tank **12** and a lower tank **14** for temporarily storing the cooling water, and a core **16** for passing the cooling water (Paragraph 0032). Hirakata et al. also teach that the cooling water cooled and stored in the lower tank **14** flows out from the lower tank **14** to reach the fuel cell **30** through the cooling water passage **60**. A water pump **70** is provided midway in the cooling water passage **60** so as to forcibly circulate the cooling water flowing through the cooling water passage **60**. The water pump **70** and another water pump **76** which will be described later are both electrically driven (Paragraph 0034).

With respect to the liquid storage container communicating with the circulation passage via a gas drawing passage and wherein the air incorporated into the siglan pressure pipe from the supply air piple side is pushed back towards said air supply pipe, Hirakata et al. teach that when the pressure inside the upper tank **12** is high, the cooling water is pushed out as described above from the upper tank **12** into the reserve tank **20**

through the cooling water tube **65** "gas drawing passage" so that the hydrogen gas caught within the upper tank **12** is also pushed out into the reserve tank **20** along with the cooling water. The hydrogen gas pushed out together with the cooling water turns into bubbles in the cooling water **22** and floats up to the surface of the water, to be present at the top of the reserve tank **20** (Paragraph 0058). Hirakata also teach that the reserve tank **20** is a simple sealed type reserve tank, and an air intake tube **66** connects to the reserve tank **20** to maintain atmospheric pressure inside the reserve tank **20** (Paragraph 0043).

With respect to exhausting the gas, Hirakata et al. teach that in the heat exchange system of the present embodiment, if hydrogen gas leaks into the cooling water, the hydrogen sensors **50** and **52** immediately detect the leakage, and the hydrogen gas leakage warning lamp **92** informs the driver of the leakage. The hydrogen gas collected in the upper tank **12** "hydrogen separator" of the radiator **10** and the hydrogen gas collected at the top of the reserve tank **20** "hydrogen separator" can be easily discharged "exhausted" into the air by opening the radiator cap **18** and the cooling water supply cap **24**, respectively (Paragraph 0060).

Hirakata et al. does not specifically teach using air supplied to or exhausted from the fuel cell. However, Mizuno disclose an on-vehicle structure of fuel cell system wherein the hydrogen gas discharged from the shut valve **412** is supplied to the hydrogen dilutor **424** after flowing through the discharging channel **405**. Oxygen off-gas is also supplied to the hydrogen dilutor **424** after flowing through the oxygen off-gas introducing channel **505** which branches from the oxygen off-gas discharging channel

503. The hydrogen dilutor **424** dilutes the discharged hydrogen gas from the shut valve **412** by mixing the supplied hydrogen gas and the oxygen off-gas. The diluted hydrogen gas is introduced into the oxygen off-gas discharging channel **503** and is further mixed with the oxygen off-gas flowing in the oxygen off-gas discharging channel **503**. Then the mixed gas is exhausted into the external atmosphere from the off-gas discharging outlet **514**. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the dilution of hydrogen gas with exhaust air system of Mizuno to dilute the hydrogen of Hirakata et al. because an air diluted exhaust gas with low hydrogen concentration is more safe.

With respect to claims 4 and 6, With respect to exhausting the gas, Hirakata et al. teach that in the heat exchange system of the present embodiment, if hydrogen gas leaks into the cooling water, the hydrogen sensors **50** and **52** immediately detect the leakage, and the hydrogen gas leakage warning lamp **92** informs the driver of the leakage. The hydrogen gas collected in the upper tank **12** “hydrogen separator” of the radiator **10** and the hydrogen gas collected at the top of the reserve tank **20** “hydrogen separator” can be easily discharged “exhausted” into the air by opening the radiator cap **18** “means for changing pressure of air exhausted from the fuel cell” and the cooling water supply cap **24**, respectively (Paragraph 0060).

Hirakata et al. also teach that when the pressure inside the upper tank **12** is high, the cooling water is pushed out as described above from the upper tank **12** into the reserve tank **20** through the cooling water tube **65** “gas drawing passage” so that the

hydrogen gas caught within the upper tank **12** is also pushed out into the reserve tank **20** along with the cooling water. The hydrogen gas pushed out together with the cooling water turns into bubbles in the cooling water **22** and floats up to the surface of the water, to be present at the top of the reserve tank **20** (Paragraph 0058). Hirakata also teach that the reserve tank **20** is a simple sealed type reserve tank, and an air intake tube **66** connects to the reserve tank **20** to maintain atmospheric pressure inside the reserve tank **20** "exhaust pipe" (Paragraph 0043).

With respect to claim 10,16,17 and 19, Hirakata et al. teach that in the heat exchange system of the present embodiment, if hydrogen gas leaks into the cooling water, the hydrogen sensors **50** and **52** "means for detecting fuel gas" immediately detect the leakage, and the hydrogen gas leakage warning lamp **92** informs the driver of the leakage. The hydrogen gas collected in the upper tank **12** "hydrogen separator" of the radiator **10** and the hydrogen gas collected at the top of the reserve tank **20** "hydrogen separator" can be easily discharged "exhausted" "decrease pressure" into the air by opening the radiator cap **18** "means for controlling flow of ventilation current" "means for increasing ventilation amount" and the cooling water supply cap **24**, respectively (Paragraph 0060).

With respect to claims 11,12 and 18, Hirakata et al. teach that when the pressure inside the upper tank **12** is high, the cooling water is pushed out as described above from the upper tank **12** into the reserve tank **20** through the cooling water tube **65** "gas

drawing passage" so that the hydrogen gas caught within the upper tank **12** is also pushed out into the reserve tank **20** along with the cooling water. The hydrogen gas pushed out together with the cooling water turns into bubbles in the cooling water **22** and floats up to the surface of the water, to be present at the top of the reserve tank **20** (Paragraph 0058). Hirakata also teach that the reserve tank **20** is a simple sealed type reserve tank, and an air intake tube **66** connects to the reserve tank **20** to maintain atmospheric pressure "stationary pressure" inside the reserve tank **20** "exhaust pipe" (Paragraph 0043).

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hirakata (U.S. Pub. No. 2001/0019789 A1) in view of Mizuno (U.S. Pub. No. 2002/0189873 A1) as applied to claim 3 above and further in view of Kaneko et al. (U.S. Patent No. 4,923,768).

With respect to claim 7, Hirakata et al. as modified by Mizuno disclose a heat exchange system (title) in paragraph 7 above.

Hirakata et al. as modified by Mizuno do not specifically teach means for changing the pressure of the air supplied to the fuel cell from the air supply pipe. However, Kaneko et al. disclose a fuel cell power generation system (title) wherein the fuel cell power generation system of the present invention comprises an air pressure control circuit means having a pressure sensing device on the outlet side of the compressor and a flow rate control valve on the inlet side of the compressor. The control circuit serves to improve partial load efficiency by allowing the adjustment of

reaction air flow to maintain constant reaction air pressure in the fuel cell (Col 3 lines 20-35). Axial power of the reaction air compressor is controlled in order to maintain a predetermined outlet pressure at a constant value, or within a desired range, by controlling a flow rate valve connected to the inlet side of the compressor which is effective, for example, in lowering the flow rate during the partial load operation. The axial power of the compressor during the partial load operation can also be lowered by control of the drive motor and the partial load efficiency can be improved (Col 3 lines 60-67). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the controlling of the air feed of Kaneko et al. into the fuel cell system of Hirakata et al. as modified by Mizuno in order to improve partial load efficiency (Col 3 lines 60-67).

9. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirakata (U.S. Pub. No. 2001/0019789 A1) in view of Mizuno (U.S. Pub. No. 2002/0189873 A1) and further in view of Jia et al. (U.S. Pub. No. 2003/0224226 A1).

With respect to claim 13, Hirakata et al. disclose a heat exchange system (title) wherein a radiator **10** is a heat exchange device for cooling the cooling water warmed by the fuel cell **30**, and includes an upper tank **12** and a lower tank **14** for temporarily storing the cooling water, and a core **16** for passing the cooling water (Paragraph 0032).

With respect to the mixing of the separated gas with the air supplied or exhausted from the fuel cell, Hirakata teach that when the pressure inside the upper tank **12** is high, the cooling water is pushed out as described above from the upper tank

12 into the reserve tank **20** through the cooling water tube **65** so that the hydrogen gas caught within the upper tank **12** is also pushed out into the reserve tank **20** along with the cooling water. The hydrogen gas pushed out together with the cooling water turns into bubbles in the cooling water **22** and floats up to the surface of the water, to be present at the top of the reserve tank **20** (Paragraph 0058). Hirakata also teach that the reserve tank **20** is a simple sealed type reserve tank, and an air intake tube **66** connects to the reserve tank **20** to maintain atmospheric pressure inside the reserve tank **20** (Paragraph 0043).

With respect to exhausting the gas, Hirakata et al. teach that in the heat exchange system of the present embodiment, if hydrogen gas leaks into the cooling water, the hydrogen sensors **50** and **52** immediately detect the leakage, and the hydrogen gas leakage warning lamp **92** informs the driver of the leakage. The hydrogen gas collected in the upper tank **12** "hydrogen separator" of the radiator **10** and the hydrogen gas collected at the top of the reserve tank **20** "hydrogen separator" can be easily discharged "exhausted" into the air by opening the radiator cap **18** and the cooling water supply cap **24**, respectively (Paragraph 0060).

Hirakata et al. does not specifically teach using air supplied to or exhausted from the fuel cell. However, Mizuno disclose an on-vehicle structure of fuel cell system wherein the hydrogen gas discharged from the shut valve **412** is supplied to the hydrogen dilutor **424** after flowing through the discharging channel **405**. Oxygen off-gas is also supplied to the hydrogen dilutor **424** after flowing through the oxygen off-gas introducing channel **505** which branches from the oxygen off-gas discharging channel

503. The hydrogen dilutor **424** dilutes the discharged hydrogen gas from the shut valve **412** by mixing the supplied hydrogen gas and the oxygen off-gas. The diluted hydrogen gas is introduced into the oxygen off-gas discharging channel **503** and is further mixed with the oxygen off-gas flowing in the oxygen off-gas discharging channel **503**. Then the mixed gas is exhausted into the external atmosphere from the off-gas discharging outlet **514**. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the dilution of hydrogen gas with exhaust air system of Mizuno to dilute the hydrogen of Hirakata et al. because an air diluted exhaust gas with low hydrogen concentration is more safe.

With respect to returning the mixed gas into said air supply air pipe via said outflow pipe, Hirakata et al as modified by Mizuno disclose a heat exchange system (title) in paragraph 2 above. Hirakata et al. as modified by Mizuno do not specifically teach wherein the gas mixed with air supplied to the fuel cell is introduced into the cathode of the fuel cell. However, Jia et al. disclose a conditioning methode for fuel cells (title) wherein, controller **18** signals oxidant shutoff valve **15** to close and signals fuel shutoff valve **16** and fuel conditioning valve **17** to open thereby providing hydrogen directly to cathode **4** (Paragraph 0021). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the hydrogen feed to the cathode of Jia et al. into the fuel cell system of Hirakata et al. as modified by Mizuno because combustion of hydrogen internally as opposed to environmental exhaustion improves safety of the fuel cell system.

With respect to claim 14, Hirakata et al. teach that in the heat exchange system of the present embodiment, if hydrogen gas leaks into the cooling water, the hydrogen sensors **50** and **52** "means for detecting fuel gas" immediately detect the leakage, and the hydrogen gas leakage warning lamp **92** informs the driver of the leakage. The hydrogen gas collected in the upper tank **12** "hydrogen separator" of the radiator **10** and the hydrogen gas collected at the top of the reserve tank **20** "hydrogen separator" can be easily discharged "exhausted" into the air by opening the radiator cap **18** and the cooling water supply cap **24**, respectively (Paragraph 0060).

Response to Arguments

10. Applicant's arguments filed on May 9th, 2007 have been fully considered but they are not persuasive.

Applicant's principal arguments are

(a) Applicants submit that Hirakata and Mizuno do not teach "separating the fuel gas from the cooling liquid, mixing the separated gas with the air supplied to or exhausted from said fuel cell and then exhausting the gas," as recited in claim 1.

(b) Applicants submit that Hirakats and Mizuno do not teach "the gas mixed with air supplied to the fuel cell is introduced into a cathode of the fuel cell," as recited in claim 2. In Mizuno, the diluted hydrogen gas is introduced into the oxygen off gas discharging

channel (503) and is further mixed with the oxygen off-gas flowing in the oxygen off-gas discharging channel (503). Mizuno, however, does not teach that "the gas mixed with air supplied to the fuel cell is introduced into a cathode of the fuel cell," as recited in claim 2.

(c) As discussed above, the hydrogen dilutor (424) of the Mizuno reference mixes the hydrogen gas discharged from a fuel cell with the oxygen off-gas that is also discharged from the fuel cell. The Mizuno reference, however, does not teach that the cooling liquid storage container communicates with a supply air pipe which supplies air into the fuel cell, or with an exhaust pipe, which exhausts the air from the fuel cell, via a signal pressure pipe, as recited in claim 3. The cited references do not teach the signal pressure pipe recited in claim 3. The signal pressure pipe recited in claim 3 enables the cooling liquid storage container to communicate with the supply air pipe or with the exhaust pipe. The combination of the Hirakata and Mizuno references does not teach any pipe that connects the upper tank (12) or the reserve tank (24) of the Hirakata reference to the supply air pipe or with the exhaust pipe of a fuel cell.

(d) Applicants submit that Hirakata and Mizuno do not teach "a gas phase portion that communicates with a supply air pipe, which supplies air into said fuel cell via a flow-in pipe, and which mixes the gas separated from the cooling liquid within said liquid phase

portion with the air flowing therein through said flow-in pipe from said supply air pipe," as recited in claim 9.

(e) Applicants submit that Hirakata and Mizuno do not teach "a gas exhaust mechanism, which communicates with said air pipe via a ventilation pipe, and which exhausts the fuel gas in said cooling liquid storage container out of the system by a ventilation current flowing within said ventilation pipe," as recited in claim 15.

(f) Applicants respectfully submit that Hirakata, Mizmo and Jia do not teach "a gas phase portion which communicates with a supply air pipe, which supplies air into said fuel cell via a flow-in pipe and via a flow-out pipe, and which mixes the gas separated from the cooling liquid within said liquid phase portion with the air flowing therein through said flow-in pipe from said supply air pipe, and returns the mixed gas into said supply air pipe via said flow-out pipe," as recited in claim 13.

In response to Applicant's arguments, please consider the following comments.

(a) With respect to separating the fuel gas from the cooling liquid, Hirakata et al. teach that in the heat exchange system of the present embodiment, if hydrogen gas leaks into the cooling water, the hydrogen sensors **50** and **52** "means for detecting fuel

gas" immediately detect the leakage, and the hydrogen gas leakage warning lamp **92** informs the driver of the leakage. (It is noted that hydrogen gas is separated from the cooling liquid in tanks **12** and **20** due to their difference in density)

With respect to the mixing of the separated gas with the air supplied or exhausted from the fuel cell, Hirakata teach that when the pressure inside the upper tank **12** is high, the cooling water is pushed out as described above from the upper tank **12** into the reserve tank **20** through the cooling water tube **65** so that the hydrogen gas (separated gas) caught within the upper tank **12** is also pushed out into the reserve tank **20** along with the cooling water. The hydrogen gas pushed out together with the cooling water turns into bubbles in the cooling water **22** and floats up to the surface of the water, to be present at the top of the reserve tank **20** (Paragraph 0058). Hirakata also teach that the reserve tank **20** is a simple sealed type reserve tank, and an air intake tube **66** connects to the reserve tank **20** to maintain atmospheric pressure inside the reserve tank **20** (Paragraph 0043). (It is noted that air form air intake tube mixes with hydrogen at the top of tank **20**).

With respect to exhausting the gas, Hirakata et al. teach that the hydrogen gas collected in the upper tank **12** "hydrogen separator" of the radiator **10** and the hydrogen gas collected at the top of the reserve tank **20** "hydrogen separator" can be easily discharged "exhausted" into the air by opening the radiator cap **18** and the cooling water supply cap **24**, respectively (Paragraph 0060).

(b) Hirakata et al. as modified by Mizuno do not specifically teach wherein the gas mixed with air supplied to the fuel cell is introduced into the cathode of the fuel cell. However, Jia et al. disclose a conditioning methode for fuel cells (title) wherein, controller **18** signals oxidant shutoff valve **15** to close and signals fuel shutoff valve **16** and fuel conditioning valve **17** to open thereby providing hydrogen directly to cathode **4** (Paragraph 0021). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the hydrogen feed to the cathode of Jia et al. into the fuel cell system of Hirakata et al. as modified by Mizuno because combustion of hydrogen internally as opposed to environmental exhaustion improves safety of the fuel cell system.

(c) and (d) Hirakata et al. does not specifically teach using air supplied to or exhausted from the fuel cell. However, Mizuno disclose an on-vehicle structure of fuel cell system wherein the hydrogen gas discharged from the shut valve **412** is supplied to the hydrogen dilutor **424** after flowing through the discharging channel **405**. Oxygen off-gas is also supplied to the hydrogen dilutor **424** after flowing through the oxygen off-gas introducing channel **505** which branches from the oxygen off-gas discharging channel **503**. The hydrogen dilutor **424** dilutes the discharged hydrogen gas from the shut valve **412** by mixing the supplied hydrogen gas and the oxygen off-gas. The diluted hydrogen gas is introduced into the oxygen off-gas discharging channel **503** and is further mixed with the oxygen off-gas flowing in the oxygen off-gas discharging channel **503**. Then the mixed gas is exhausted into the external atmosphere from the off-gas discharging

outlet **514**. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the dilution of hydrogen gas with exhaust air system of Mizuno to dilute the hydrogen of Hirakata et al. because an air diluted exhaust gas with low hydrogen concentration is more safe.

(e) Hirakata et al. teach that when the pressure inside the upper tank **12** is high, the cooling water is pushed out as described above from the upper tank **12** into the reserve tank **20** through the cooling water tube **65** "gas drawing passage" so that the hydrogen gas caught within the upper tank **12** is also pushed out into the reserve tank **20** along with the cooling water. The hydrogen gas pushed out together with the cooling water turns into bubbles in the cooling water **22** and floats up to the surface of the water, to be present at the top of the reserve tank **20** (Paragraph 0058). Hirakata et al. also teach that The hydrogen gas collected in the upper tank **12** "hydrogen separator" of the radiator **10** and the hydrogen gas collected at the top of the reserve tank **20** "hydrogen separator" can be easily discharged "exhausted" into the air by opening the radiator cap **18** and the cooling water supply cap **24**, respectively (Paragraph 0060) (It is noted that since the hydrogen gas is under pressure when discharged then this would establish a "ventilation current").

(f) With respect to returning the mixed gas into said air supply air pipe via said outflow pipe. Hirakata et al. as modified by Mizuno do not specifically teach wherein the gas mixed with air supplied to the fuel cell is introduced into the cathode of

the fuel cell. However, Jia et al. disclose a conditioning method for fuel cells (title) wherein, controller **18** signals oxidant shutoff valve **15** to close and signals fuel shutoff valve **16** and fuel conditioning valve **17** to open thereby providing hydrogen directly to cathode **4** (Paragraph 0021). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the hydrogen feed to the cathode of Jia et al. into the fuel cell system of Hirakata et al. as modified by Mizuno because combustion of hydrogen internally as opposed to environmental exhaustion improves safety of the fuel cell system.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben Lewis whose telephone number is 571-272-6481. The examiner can normally be reached on 8:30am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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